

Prevalence of cannabinoid hyperemesis syndrome and its financial burden on the health care industry

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ABSTRACT

Cannabis is the most commonly consumed recreational drug in the world. As more states legalize cannabis use in some form, the incidence of cannabinoid hyperemesis syndrome (CHS) is expected to rise. CHS is a constellation of symptoms including severe cyclical nausea and vomiting and epigastric or periumbilical abdominal pain as a result of long-term cannabis use. Recognizing the diagnosis and educating patients on the benefits of cessation is essential, as these patients often undergo extensive and repeated evaluations in the clinic, emergency department, and inpatient setting that could be avoided with extensive history taking and early recognition of the syndrome. In this study, we compared costs incurred by patients in various settings to determine if there is a difference between patients with and without CHS. Although there were not statistically significant cost differences between groups for all cost categories, it is clear that patients with CHS consume considerably more health care dollars than patients who deny cannabis use, and obtaining a detailed social history is imperative to prevent unnecessary workups and increased financial burden on the health care industry.

KEYWORDS Cannabis; emergency medicine; health care economics

Cannabis is known to have been consumed as early as 500 BC and is the most commonly used recreational drug, with 2.5% of the population (147 million people) using it worldwide.^{1,2} As the legalization of cannabis in the United States increases, the medical effects of cannabis have become a topic of heated political debate. Cannabinoids' many therapeutic properties have been described and documented³; however, with cannabis use ≥ 1 year, users may develop increased episodes of nausea and vomiting, called cannabinoid hyperemesis syndrome (CHS). CHS is characterized by severe cyclical nausea and vomiting and abdominal pain as a result of daily to weekly long-term cannabis use that is often relieved with hot showers.⁴ Efforts to better characterize this syndrome have primarily focused on the underlying pathophysiology and potential treatment options. However, a cost analysis has yet to be undertaken, although patients with these symptoms undergo repeated and often exhaustive evaluations. The

purpose of our study was to estimate the financial burden of CHS on the health care industry.

METHODS

This was a retrospective observational cohort study in a large not-for-profit integrated health system in central Texas (Baylor Scott and White Medical Center – Temple). The date range for data collection was July 1, 2005, to July 31, 2015, with statistical analysis performed in 2018. The study was approved by the Baylor Scott and White institutional review board.

To be included, patients had to be 18 to 65 years of age, with a diagnosis of vomiting as determined by International Statistical Classification of Diseases and Related Health Problems 9th revision (ICD-9 codes 787.01, 787.02, 787.03, and 536.2) and an encounter in any of the following settings: emergency department (ED),

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ambulatory primary care clinic, or hospital admission. Hospital observation encounters were included as an admission for the purposes of this study. Exclusion criteria included having a preexisting condition or documented underlying disease state that would readily explain their symptoms and thus preclude a diagnosis of CHS (obstructive pathophysiology, pregnancy, hyperemesis gravidarum, motility disorders, gastroenteritis, pancreaticobiliary pathology, central nervous system pathology).

Investigators took the results of the initial search and, for each medical record number, extracted the following data for the three most recent visits in each setting (ED, ambulatory primary care clinic, or hospital admission): primary and secondary diagnosis (ICD-9), incidence of admissions for the same or a similar diagnosis, incidence of visits for each setting, whether nausea or vomiting was present, abdominal pain, length of time symptoms were present, number of vomiting episodes per day, use of cannabis as determined by

positive urine drug screen, comorbid conditions, length of hospitalization if admitted, whether a referral to gastroenterology was placed, whether an endoscopic evaluation was done, laboratory tests, radiological imaging or procedures, and medications given, with evaluation of narcotics and antiemetics separately.

Costs for laboratory tests, imaging, procedures, and medications were calculated for each visit based on the Medicare national database. Additional data were collected such as age, sex, race, ethnicity, body mass index (BMI), employment, education (high school, college, graduate), and funding (self-pay or insured). A diagnosis of CHS was made by identifying the clinical characteristics associated with it such as chronic cannabis use, cyclical vomiting, abdominal pain, and the compulsive need to take hot showers in patients without other identifiable causes.

Sample characteristics were described using descriptive statistics. Categorical variables were described by frequencies and percentages. Continuous variables were described by means and standard deviations (or medians and ranges where appropriate). Bivariate analyses were done using chi-square tests, Fisher's test, and Wilcoxon rank sum test. Statistical significance was set at a *P* value < 0.05. A generalized estimating equation model was used to find the averages of interest and to make the comparisons while also accounting for the repeated visits within each patient. Due to the subjectivity of CHS diagnosis, no proper sensitivity and specificity analysis was performed. SAS 9.4 software was used to perform the statistical analysis. Data were catalogued using a password-protected Microsoft Excel spreadsheet.

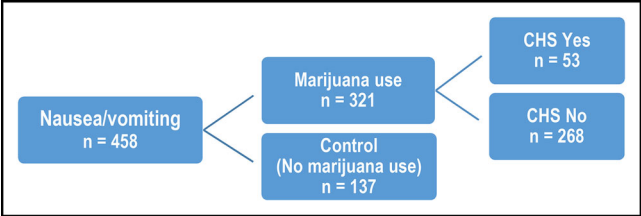


Figure 1. Data from 458 patients with a diagnosis of nausea and vomiting were pulled from the electronic database.

Table 1. Costs for cannabinoid hyperemesis syndrome*

Cost	Visit	CHS Yes	CHS No	Control
Total	ED	1425 (1042, 1807)	1727 (1493, 1960)	248 (207, 289)
	Clinic	695 (411, 979)	887 (660, 1113)	421 (271, 571)
	Admit	4095 (3205, 4985)	4934 (4224, 5644)	874 (720, 1027)
Laboratory tests	ED	66 (59, 73)	58 (53, 62)	55 (48, 63)
	Clinic	16 (8, 23)	16 (11, 20)	9 (5, 13)
	Admit	195 (168, 222)	199 (177, 222)	171 (149, 193)
Imaging	ED	1157 (805, 1510)	1558 (1346, 1770)	217 (177, 257)
	Clinic	184 (44, 325)	286 (172, 399)	36 (17, 55)
	Admit	3045 (2373, 3716)	3378 (2866, 3889)	424 (341, 507)
Procedures	ED	114 (0, 242)	80 (0, 164)	22 (2, 41)
	Clinic	458 (206, 710)	572 (399, 745)	405 (241, 569)
	Admit	675 (288, 1063)	1094 (712, 1476)	274 (138, 410)
Medications	ED	89 (54, 124)	42 (34, 49)	19 (11, 26)
	Clinic	49 (10, 87)	43 (7, 80)	10 (3, 17)
	Admit	180 (118, 242)	279 (196, 362)	108 (72, 142)

*Data are presented as rounded dollars, with mean and 95% confidence interval. CHS indicates cannabinoid hyperemesis syndrome; ED, emergency department.

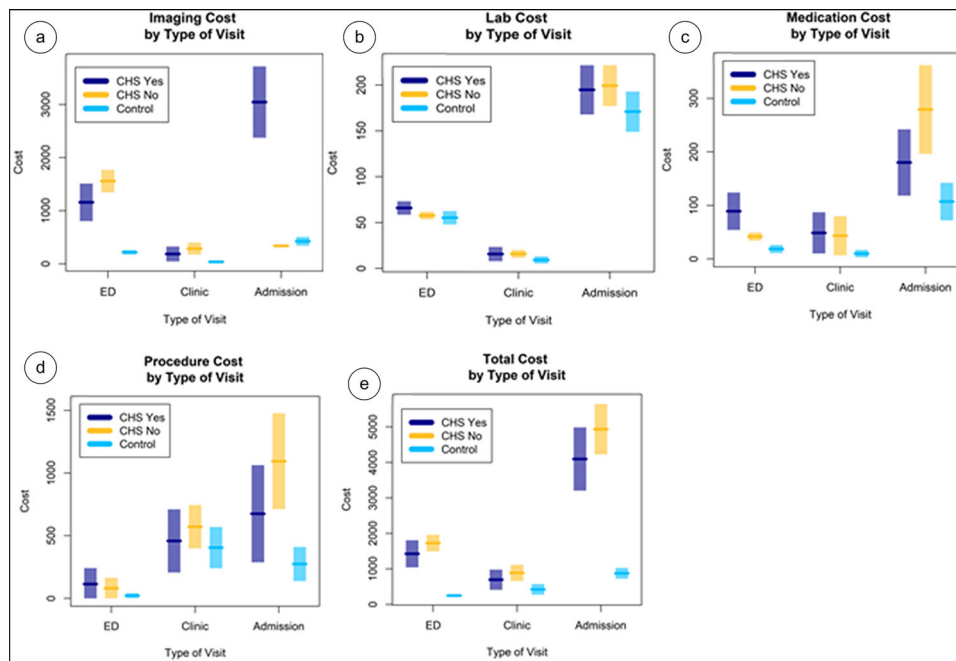


Figure 2. Cost of (a) imaging, (b) laboratory tests, (c) medications, (d) procedures, and (e) total costs for patients with and without confirmed cannabinoid hyperemesis syndrome (CHS) compared to control groups in the emergency department, clinic, and admission setting.

RESULTS

Data for 458 patients with a diagnosis of nausea and vomiting were pulled from the electronic database. A total of 321 patients with nausea and vomiting in the setting of marijuana use were reviewed and compared with 137 controls with a diagnosis of nausea and vomiting without marijuana use. Among the 321 patients, 53 (16.51%) were suspected of having CHS (CHS Yes), while 268 (83.5%) were not suspected of having CHS (CHS No) (Figure 1). In the 321 patients, there were 664 ED visits, 350 clinic visits, and 296 admissions; patients with suspected CHS comprised 21.5% of the ED visits and 34.9% of the admissions.

Cost comparisons are shown in Table 1 and Figure 2. For total costs in the ED, clinic, and admit groups, there was a statistically significant difference between CHS Yes, No, and Control ($P < 0.0001$, $P < 0.0001$), CHS No and Control ($P = 0.001$), and CHS Yes, No, and Control ($P < 0.0001$, $P < 0.0001$), respectively. For lab costs, no significant differences were detected between the groups. For imaging costs, in the ED, clinic, and admit groups, there was a significant difference between CHS Yes, No, and Control ($P < 0.0001$, $P < 0.0001$), CHS Yes, No, and Control ($P < 0.0001$, $P < 0.047$), and CHS Yes, No, and Control ($P < 0.0001$, $P < 0.0001$), respectively. For procedure costs in the ED, clinic, and admit groups, no significant association was detected between the ED and clinic groups, but there was a significant difference between CHS Yes, No, and Control ($P < 0.0001$, $P = 0.0003$) for the admit group. For medication costs, no significant association was detected in the clinic group, but in the ED and admit groups, there was a significant difference between CHS Yes, No, and Control (P

$= 0.0004$, $P < 0.0001$) and CHS Yes, No, and Control ($P = 0.0486$, $P = 0.0004$), respectively.

DISCUSSION

Many facets of CHS have been described; however, research to determine the pathophysiology behind this paradoxical syndrome is ongoing. A detailed social history is recommended for patients with suspected CHS. It is estimated that it takes approximately 1 to 2 years before a diagnosis of either CHS or cyclical vomiting syndrome is made, leading to unnecessary workup and increased financial burden on the health care industry.²

As no diagnostic or lab test for CHS exists, early recognition of it could potentially avert considerable misutilization of time and resources. Our study shows that patients with CHS consume considerably more health care dollars than patients who deny cannabis use. Although many of the statistics performed showed no significant difference between groups with or without a diagnosis of CHS, it is worth noting that patients in the CHS No group may later be diagnosed with CHS as more symptoms develop with continued cannabis use.

CHS appears clinically similar to cyclical vomiting syndrome, and it can be difficult to determine the underlying disorder if cannabis use is present in a patient with cyclical vomiting syndrome. Many patients are incorrectly diagnosed with cyclical vomiting syndrome, only to be later diagnosed with CHS when further inquiry is made.⁴ This supports the hypothesis that CHS occurs more commonly than is reported.

As there is no defining clinical symptom and patient presentation may not clearly indicate CHS, it is imperative to obtain a detailed social history. Supportive care with intravenous fluids and antiemetics in the acute setting, ultimately combined with cannabis cessation, has been shown to have the most benefit for resolution of symptoms. Various pharmacotherapies, including benzodiazepines, capsaicin cream, haloperidol, and tricyclic antidepressants, have all been used with little evidence to suggest superiority of any one class in the treatment of CHS.^{5,6}

Although this study was undertaken at a single health care system and describes the economic impact at a single location, the results may be extrapolated to a national level. There is evidence to show that CHS incidence has been rising with legalization of cannabis and, thus, this has become a national public health issue.^{2,7} As the prevalence of CHS will increase in the setting of higher rates of legal and illegal marijuana use, patient education is paramount, as marijuana cessation has been shown to be the only definitive treatment and patients often increase cannabis use in an effort to mitigate nausea.⁸ Additional research is warranted to determine the pathophysiology of this growing condition in order to develop proper treatment strategies. Similarly, physician awareness of and education on this relatively new, but costly, condition is necessary to provide early recognition of the disease, appropriate patient care, and decreased financial burden on the health care system.

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